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Cihan H. Dagli, Editor in Chief
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Preface

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Global society depends on integrated complex, distributed engineering systems that can adapt to the dynamically changing needs of society. These emerging systems are nonlinear, distributed, global, and adaptive to their environment in both space and time, thereby creating emergent behaviors. This is true in current infrastructures, healthcare, transportation, energy, defense and security, communications, supply chains, global manufacturing, and environmental systems.

The global society, through integrated complex and distributed systems, makes increasing use of data intensive technologies, resulting in the continuous generation of Big Data. Some retail supply chain leaders can handle over a million customer transactions per hour, which in turn imports into databases estimated at over 2.5 petabytes. Complex Systems of today are highly non-linear, integrated, and continuously generate and use Big Data that is encapsulated within them as systems evolve. Harnessing this Big Data requires new approaches in data analytics, creating new research professions such as Data Scientists.

Adaptability - or the ability to change in time based on the environment created through interaction with other complex systems creating Big Data over time - is another attribute that needs to be embraced in designing and evolving systems. Computational Intelligence methods and techniques are an important adaptability component of Embedded Complex Systems architectures that are continuously evolving in time. We need to harness Big Data while embracing the complexity in engineering the Complex Adaptive Systems of today.

The 2012 Complex Adaptive Systems conference pushed the boundaries of research by both embracing this complexity and harnessing Big Data for creating Complex Adaptive Systems for Cyber Security, Distributed Networks, and the Smart Grid.

This publication of the Complex Adaptive Systems Proceedings series contains the edited versions of the technical presentations of Complex Adaptive Systems, which was held November 14 - 16, 2012 in Washington D.C. U.S.A. The extended version of each selected paper was reviewed by two referees, and then revised, edited and condensed to the format herein. The proceedings have six chapters; Complex Systems, Computational Intelligence and Machine Learning, Adaptive Big Data Analytics, Energy, Smart Grid Design and Infrastructure, Distributed Networks and Biologically Inspired Paradigms. The first part of the proceedings covers Complex Systems. The adaptiveness attribute of complex systems is covered through Part II: Computational Intelligence and Machine

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Learning. In order to achieve adaptiveness we need to depend on data continuously being added to complex systems while they are interacting with their environment and other complex adaptive systems. Part III covers Adaptive Big Data Analytics. This year the complex systems that we are studying heavily are energy, smart grid, infrastructure systems and distributed networks covered in Parts IV and V. The last chapter covers recent research on biologically inspired paradigms that will help in developing new algorithms for big data analytics and adapativeness.

During the conference cyber security, big data and complexity were addressed through plenary speakers and panels. Robert D. Rodriguez, Chairman and Founder of Security Innovation Network and Ralph Martinez, Director of Energy Initiatives and Distinguished Professor at The University of Texas at El Paso were asked to speak on the topic of Cyber Security. A panel discussion on Cyber Security was also included, led by Charles Croom, Vice President of Cyber Security Solutions for Lockheed Martin Information Systems & Global Solutions.

Haden Land, Vice President and Chief Technology Officer of Lockheed Martin IS&GS – Civil was asked to discuss Complex systems. John Norris was asked to speak on the topic of Complexity and lead a panel discussion focused on Complex Systems of Healthcare.

Vasant Honavar, Program Director of the Information Integration and Informatics Program of the National Science Foundation, as well as, Viswa Sharma, Senior Solutions Architect of Tata Consultancy Services were asked to speak on the subject of Big Data. A panel discussion focused on Big Data was also held by Greg Kaple, Founder of GAK3.

I would like to once again thank the authors for their contributions to the proceedings and presentations at the conference, which enabled the creation of this volume. Further, I wish to express my gratitude to all referees for their comments and suggestions for revising the papers and the conference co-chairs who worked diligently in creating each track.

I would like to mention our appreciation to conference sponsors namely; Lockheed Martin, Mocana, Tata Consultancy Services, GAK3, Drexel University Online, and Hark.com for bringing real life dimension, issues and engineering problems to the meeting. I would also thank Sue Turner and Latesha Zach for all their help and efforts enabling me to sail smoothly in the organization of this conference and production of this volume.

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St. Louis, Missouri, USA
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